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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/529,758

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EXAMINER

TOLIN, MICHAEL A

ART UNIT

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1791

MAIL DATE

DELIVERY MODE

10/22/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/529,758	Applicant(s) HIRATA ET AL.	
	Examiner MICHAEL A. TOLIN	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 17-29 is/are pending in the application.
- 4a) Of the above claim(s) 20-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :3-13-07, 5-16-06, 6-29-05, 3-30-05.

DETAILED ACTION

Information Disclosure Statement

1. In the IDS filed 29 June 2005, JP 2001-073226 was crossed off because this reference was cited by the examiner with an attached machine translation in the previous office action. This reference has been considered.

Election/Restrictions

2. Applicant's election without traverse of claims 1-15 and 17-19 in the reply filed on 11 August 2008 is acknowledged.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 2, it is not clear from the specification or the claims specifically how "free volume diameter" is determined. Also, the term "free volume diameter" does not have a specific meaning in the art and not been defined by the specification or the claims. The examiner suggests providing evidence as to how one of ordinary skill in the

Art Unit: 1791

art would have interpreted the claimed free volume diameter and positron extinction method.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-7, 12-15 and 17-19 are rejected under 35 U.S.C. 102(a,e) as being anticipated by Dugan (US 6583075).

Dugan teaches a method of manufacturing a carbon fiber comprising the steps of melt spinning polyacrylonitrile and a thermoplastic resin into a precursor fiber (column 1, lines 8-10; column 2, lines 14-23; column 7, lines 66-67; column 8, lines 1-24), providing the polyacrylonitrile and thermoplastic resin within the claimed relative weight range (column 8, lines 25-30), performing the claimed stabilization treatment (column 11, lines 42-54), removing the thermoplastic resin (column 8, lines 1-15), and carbonizing or graphitizing (column 11, lines 55-67; column 12, lines 1-4). It is noted that Dugan teaches melt spinning to form islands-in-the-sea fibers (Figure 1F), and thus satisfies the claimed limitation of “spinning a mixture”. There is no requirement in claim 1 of

Art Unit: 1791

kneading the thermoplastic carbon precursor and the thermoplastic resin to form a mixture and subsequently melt spinning the mixture.

Regarding claims 2-4 and 6, one of ordinary skill in the art would have taken the teaching of polyolefin (column 8, line 13) to be a clear teaching of polyethylene and polypropylene since the term polyolefin is commonly used to identify polyethylene, polypropylene and a relatively short list of additional simple hydrocarbon polymers. It is clear from Applicant's specification that polyethylene satisfies the limitations of claims 2-4 and 6 (Applicant's specification; page 6, lines 16-34; page 7, lines 1-31; page 8, lines 1-9).

Regarding claim 5, modification of pitch does not actually require the use of pitch as the thermoplastic carbon precursor given the claim language of claim 1. It is clear from claim 1 that pitch need not be used as the thermoplastic carbon precursor.

Regarding claim 7, Dugan teaches thermoplastic carbon precursor fibers having a denier in a preferred range of about 0.005 to 0.16 which corresponds to a diameter of approximately 1-3 μm . See Dugan (column 8, lines 45-65).

The limitation of claim 12 is satisfied for the reasons provided above.

Regarding claims 13 and 14, since Dugan is directed to melt spinning the same materials which are claimed, it can reasonably be expected that extrusion temperatures and shear rates within the claimed ranges are inherent in the process of Dugan.

For the regarding claims 12-14, it is noted that the claims modify film formation, which is only one of the alternatives in claim 1. Accordingly, claims 12-14 are still satisfied by fiber formation.

Art Unit: 1791

Regarding claim 15, Dugan teaches precursor fibers having a denier of about 0.5-100, which corresponds to diameters of approximately 7-100 μm (column 8, lines 30-44).

The limitation of claim 17 is clearly taught by Dugan (column 9, lines 52-58; column 10, lines 51-60).

The limitations of claims 18 and 19 are clearly taught by Dugan (column 10, lines 61-67; column 11, lines 20-25 and lines 42-67; column 12, lines 1-4).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-7, 12-15 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaru (JP 2001-073226, referencing attached machine translation) in view of Dugan.

The claims are rejected here in the alternative in the event that the claims are interpreted to require a step of mixing the thermoplastic resin and the thermoplastic carbon precursor prior to spinning.

Masaru teaches a method of forming ultrafine carbon fibers by kneading a mixture of phenol carbon precursor resin with thermoplastic polyethylene, melt spinning

Art Unit: 1791

the resulting mixture, carbonizing at high temperature and removing the polyethylene component by pyrolysis during carbonization (Abstract; paragraphs 7, 11, 12, 14, 18-23). Masaru differs from the claims in that Masaru does not teach one of the particular claimed thermoplastic carbon precursor materials and Masaru does not teach the claimed stabilization treatment.

While Masaru suggests pitch as the carbon precursor, it is generally well known that polyacrylonitrile and pitch are alternative carbon precursor materials (see Dugan, column 1, lines 15-18). Dugan further explains that carbon fibers produced from polyacrylonitrile have high tensile strength and can be formed by melt spinning techniques (column 1, lines 46-47 and lines 66-67; column 2, lines 14-26). Dugan also suggests the claimed stabilization step in order to stabilize the shape of the melt spun fibers (column 11, lines 42-59). It would have been obvious to one of ordinary skill in the art at the time the invention to use polyacrylonitrile in a modified process of Masaru because one of ordinary skill in the art would have been motivated to use known alternative carbon precursor materials or because one of ordinary skill in the art would have been motivated to achieve the benefits of tensile strength or melt spinning properties of polyacrylonitrile, in accordance with the teachings of Dugan. As to reasonable expectation of success, like Masaru, Dugan forms composite carbon precursor/polyolefin fibers and suggests removing the polyolefin at high temperature (column 8, lines 1-15; column 11, lines 20-25). Accordingly, there would have been a reasonable expectation of success in modifying the process of Masaru to use

Art Unit: 1791

alternative carbon precursor materials such as polyacrylonitrile. As to the claimed weight range, Masaru clearly teaches this limitation (paragraphs 15, 25 and 26).

The limitations of claims 2-6 are satisfied for the reasons provided above and the rejection over Dugan alone.

Regarding claim 7, Masaru suggests the formation of fibers having a diameter of 0.1-10 μm (paragraph 26; paragraph 4).

The limitation of claim 12 is satisfied for the reasons provided above.

Regarding claims 13 and 14, since the modified method of Masaru is directed to melt spinning the same materials which are claimed, it can reasonably be expected that extrusion temperatures and shear rates within the claimed ranges are inherent in the process of Dugan. Furthermore melt spinning at temperatures and shear rates within the claimed ranges is generally well known for providing suitable fibers. It would have been obvious to provide extrusion temperatures and shear rates within the claimed ranges because one of ordinary skill in the art would have been motivated to perform the modified method of Masaru using well known suitable temperatures and shear rates for melt spinning of polyacrylonitrile and polyolefin fibers.

Regarding claim 15, Dugan teaches precursor fibers having a denier of about 0.5-100, which corresponds to diameters of approximately 7-100 μm (column 8, lines 30-44). It would have been obvious to one of ordinary skill in the art at the time of the invention to form precursor fibers having a diameter within the claimed range because one of ordinary skill in the art would have been motivated to provide precursor fibers

Art Unit: 1791

having a known suitable diameter for subsequent stabilization and carbonization in accordance with the teachings of Dugan.

Regarding claim 17, Dugan teaches the claimed stretching step for the motivation of increasing molecular orientation and providing good tenacity (column 10, lines 44-60; column 9, lines 52-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the claimed stretching step in order to achieve the above noted benefit taught by Dugan.

Regarding claim 18, Masaru teaches removal of the thermoplastic resin by high temperature treatment (paragraph 21) and suggests temperatures of 600-1200°C (paragraph 20). Dugan suggests that prior art as may occur at stabilization temperatures of 200-400°C or carbonization temperatures of 600-2000°C (column 11, lines 42-65; column 10, lines 61-67; column 11, lines 17-25). Thus it is clear from Masaru and Dugan that removal of the thermoplastic resin may occur over a wide range of temperatures. Accordingly, no more than routine experimentation is involved in determination of a suitable temperature for removal of the thermoplastic resin. Furthermore, since Applicant removes thermoplastic resin component in the same manner as Masaru and Dugan, it is reasonable to expect that such routine experimentation would yield temperatures within the claimed range as being suitable. It would have been obvious to one of ordinary skill in the art at the time of the invention to remove the thermoplastic resin component by thermal decomposition at temperatures within the claimed range because one of ordinary skill in the art would have been

Art Unit: 1791

motivated to use such temperatures as a matter of routine experimentation in view of the temperature ranges suggested by Masaru and Dugan.

Regarding claim 19, this limitation is clearly taught by Masaru and Dugan, as noted above.

9. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dugan as applied to claims 1-7, 12-15 and 17-19 above, and further in view of Powell (US 3852428) and Kiyohide (JP 03-064525).

As noted in the rejection over Dugan alone, the claims do not require forming the mixture prior to spinning. Pitch is a well known carbon fiber precursor (See Powell, Abstract). Powell suggests melt spinning, stabilization, and carbonization (column 2, lines 34-67). Powell also provides a copolymer additive in the pitch comprising an ethylene or styrene containing block copolymer (column 3, lines 25-45). In particular, Powell teaches ethylene-vinyl acetate and acrylonitrile-styrene. Applicant's specification makes it clear that these copolymers have the claimed surface tension properties (column 13, lines 1-17). The copolymer improves spinnability and increases strength of the extruded fiber (column 3, lines 1-17). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a mixture of pitch and an ethylene-vinyl acetate or acrylonitrile-styrene as the carbon precursor material in Dugan because one of ordinary skill in the art would have been motivated to use suitable known alternative carbon precursors and achieve the improved spinnability and strength taught by Powell. As to reasonable expectation of success, it is clear from Kiyohide that pitch may also be

Art Unit: 1791

spun with a thermoplastic polymer to form conjugate fibers in which the thermoplastic polymer may be subsequently removed (Abstract).

Double Patenting

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 1-6 and 12-14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 44 of copending Application No. 10/578,776. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 44 of the '776 Application, while narrower than claims 1-6 in requiring a melt blow method (a type of spinning), provides each of the currently claimed spinning, stabilization, removing, and carbonizing limitations.

Art Unit: 1791

Regarding claims 12-14, these claims modify one of the alternatives, i.e. film formation, and thus do not preclude formation of fibers.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

12. Claim 15 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 39 of copending Application No. 10/578,776. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 39 of the '776 Application clearly provides the additional limitation of current claim 15.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

13. Claims 7 and 17-19 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 37 of copending Application No. 10/578,776 in view of Dugan.

Dugan is applied as above in numbered paragraph 7 for suggesting the limitations of claims 7 and 17-19.

This is a provisional obviousness-type double patenting rejection.

Allowable Subject Matter

14. Claims 8-11 would be allowed if rewritten in independent form including all of the limitations of the base claim and any intervening claims and further amended to clearly indicate that the a mixture of the thermoplastic carbon precursor, thermoplastic resin and additional polymer is first provided and then subsequently spun into a precursor fiber.

In combination with the claimed limitations, no teaching or suggestion was found in the prior art of record to add an additional polymer having the limitations set forth in claim 8 to a mixture of carbon precursor and thermoplastic resin and subsequently spin the mixture. As explained in Applicant's specification on pages 8-13, the additional polymer acts as a compatibilizing agent which provides both finer and more uniform carbon fibers (Applicant's specification, page 11, lines 6-10). In the art of melt spinning a mixture of polymers to form ultrafine fibers, it is generally known to provide a compatibilizing agent to improve fineness and uniformity of the resulting fibers. See Anderson (US 3984514; Abstract; column 1, lines 5-20; column 2, lines 38-45 and lines at 65-68; column 3, lines 1-5). However, Anderson is directed to a very specific range of polyamide and polystyrene polymers (column 1, lines 18-20). Further, the compatibilizing agent taught by Anderson, an ethylene/acrylic acid copolymer, is not one of the compatibilizing agents suggested by Applicant. Accordingly, the examiner does not find a reasonable expectation of success in using the compatibilizer of Anderson in the method of Masaru as modified by Dugan, nor did the examiner find any other prior art which suggests adding the claimed additional polymer as set forth in

Art Unit: 1791

claim 8 to a mixture of thermoplastic resin and thermoplastic carbon precursor in the claimed process of manufacturing carbon fiber.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. TOLIN whose telephone number is (571)272-8633. The examiner can normally be reached on M-F 9am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael A Tolin/
Patent Examiner, Art Unit 1791